

US-PAT-NO: 6574354

DOCUMENT-IDENTIFIER: US 6574354 B2

TITLE: Method for detecting a face
in a digital image

DATE-ISSUED: June 3, 2003

INVENTOR-INFORMATION:

NAME	STATE	ZIP CODE	COUNTRY	CITY
Abdel-Mottaleb; Mohamed	NY	N/A	N/A	Ossining
Elgammal; Ahmed	MD	N/A	N/A	Greenbelt

APPL-NO: 09/ 790190

DATE FILED: February 22, 2001

PARENT-CASE:

This is a continuation of application Ser. No.
09/210,415, filed Dec. 11,
1998.

US-CL-CURRENT: 382/118, 382/170 , 382/224

ABSTRACT:

In order to detect a face disposed within a digital image, the pixels of the image are grouped based on whether they are skin color. The edges of the skin colored areas are removed by eliminating pixels that have surrounding pixels with a high variance in the luminance component.

The resulting connected components are classified to determine whether they could include a face. The **classification** includes examining: the area of the bounding box of the component, the aspect ratio, the ratio of detected **skin to the area** of the bounding box, the orientation of elongated objects, and the distance between the center of the bounding box and the center of mass of the component. Components which are still considered facial candidates are mapped on to a graph. The minimum spanning trees of the graphs are extracted and the corresponding components which remain are again classified for whether they could include a face. Each graph is split into two by removing the weakest edge and the corresponding components which remain are yet again classified. The graph is continually broken down until a bounding box formed around the resulting graphs is smaller than a threshold. Finally, a heuristic is performed to eliminate false positives. The heuristic compares the ratio of pixels with high variance to the total number of pixels in a face candidate component.

8 Claims, 22 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

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Abstract Text - ABTX (1):

In order to detect a face disposed within a digital image, the pixels of the image are grouped based on whether they are skin color. The edges of the skin colored areas are removed by eliminating pixels that have surrounding pixels with a high variance in the luminance component. The resulting connected components are classified to determine whether they could include a face. The **classification** includes examining: the area of the bounding box of the component, the aspect ratio, the ratio of detected **skin to the area** of the bounding box, the orientation of elongated objects, and the distance between the center of the bounding box and the center of mass of the component. Components which are still considered facial candidates are mapped on to a graph. The minimum spanning trees of the graphs are extracted and the corresponding components which remain are again classified for whether they could include a face. Each graph is split into two by removing the weakest edge and the corresponding components which remain are yet again classified. The graph is continually broken down until a bounding box formed around the resulting graphs is smaller than a threshold. Finally, a heuristic is performed to eliminate false positives. The heuristic compares the ratio of pixels with high variance to the total number of pixels in a face candidate component.